United States
Department of
Agriculture

Forest Service
Malheur National Forest
Blue Mountain Ranger District

Camp Creek Watershed Action Plan

MIDDLE FORK JOHN DAY RIVER

A NECESSARY STEP IN IMPLEMENTING THE MIDDLE COLUMBIA RIVER STEELHEAD RECOVERY PLAN & JOHN DAY SUBBASIN PLAN

NOVEMBER 2007
First Edition

DECEMBER 2008
Second Edition

Suggested Citation: USDA Forest Service. 2008. Camp Creek Watershed Action Plan, Middle Fork John Day River: A necessary step in implementing the Middle Columbia River Steelhead Recovery Plan and John Day Subbasin Plan. Malheur National Forest. John Day, Oregon. Publication Number MAL-09-01.

Cover Photo: Camp Creek, a tributary to the Middle Fork John Day River

CONTRIBUTORS

FOREST SERVICE

Tom Friedrichsen	Hydrology/Watershed
Jim Soupir	GIS
Scott Peets	Fisheries
Mike Tatum	Upland Vegetation
John LaLiberte	Roads
Holly Bentz	Engineering/Culverts
Carole Holly	Editor

OREGON DEPARTMENT OF FISH AND WILDLIFE

Tim Unterwegner	Fisheries/Population Viability
Jeff Neal	Fisheries/Population Viability

REVIEWERS & SUPPORTERS

Mark Croghan	Bureau of Reclamation
Jeff Fields	Dunstan Homestead Preserve Manager, The Nature Conservancy
Amanda Born	North Fork John Day Watershed Council
Scott Turo	Habitat Program Manager, Confederated Tribes of Warm Springs
Brian Cochran	Oxbow Conservation Area Manager, Confederated Tribes of Warm Springs
Tim Unterwegner	Fisheries Biologist, Oregon Department of Fish and Wildlife
Jeff Neal	Fisheries Biologist, Oregon Department of Fish and Wildlife
Mark McCollister	Oregon Trout
Ken Bierly	Oregon Watershed Enhancement Board
Jason Kehrberg	Grant Soil and Water Conservation District
Brooks Smith	District Ranger, Blue Mountain Ranger District, Malheur National Forest

This report was funded, in part, by the Oregon Watershed Enhancement Board and a grant from the National Fish and Wildlife Foundation to Oregon Trout.

EXECUTIVE SUMMARY

The Camp Creek Watershed (5th field) comprises an integral part of the Middle Fork John Day River subbasin, located in rural northeast Oregon. It is home to spring Chinook salmon, steelhead, bull trout, redband trout, and Pacific lamprey. This watershed is situated in the John Day River Basin, which is widely regarded as "the Columbia Basin's most biologically diverse river system and a globally important stronghold of wild salmon" (www.wildsalmoncenter.org).

Unfortunately, John Day River Basin spring Chinook salmon and steelhead numbers are considerably lower than historic levels. To address this sharp decline in fish numbers, the state of Oregon, National Marine Fisheries Service, and Northwest Power and Conservation Council have developed large-scale recovery plans. The Draft Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment (Carmichael 2007) rated the Camp Creek watershed as a high priority for habitat protection and restoration in the Middle Fork John Day River subbasin. The John Day Subbasin Revised Draft Plan (CBMRC&D 2005) listed Camp Creek as the highest priority watershed. In response to these recovery plans, the Malheur National Forest and Middle Fork Working Group (MFWG)[1] partners have created the Camp Creek Watershed Action Plan, which identifies and prioritizes site-specific restoration activities that directly address limiting factors identified in the recovery plans.

The MFWG used a watershed assessment guidance document (WPN 1999) and a prioritization process developed for the Pacific Northwest (Roni et al. 2002) to tailor a Seven-Step Approach for the Camp Creek Watershed Action Plan. This action plan will guide the MFWG along the most direct route to improved aquatic habitats and fish production. Step 1 describes the life history patterns of the Middle Columbia (MC) Steelhead and spring Chinook salmon that inhabit Camp Creek and its tributaries, providing context for Steps 2 through 7. Steps 2 through 5 detail summary results of watershed assessments and the best available professional knowledge to provide justification for protective measures (Step 2), fish passage projects (Step 3), upland treatments (Step 4), and riparian, floodplain, and channel projects (Step 5). Step 6 features a prioritized list of site-specific actions—taken from recommendations listed in Steps 2 through 5—along with cost estimates required to complete whole watershed restoration. Finally, Step 7 presents a monitoring strategy to assess the effectiveness of proposed projects.

This seven-step process was applied to three of the eight subwatersheds (6th field) that comprise the Camp Creek watershed. Five subwatersheds have been the focus of past and ongoing aquatic restoration efforts in the watershed, addressing the most glaring obstructions to fish production. Therefore, the MFWG chose the three remaining subwatersheds as the focus area of this action plan—Lower Camp Creek, Middle Camp Creek, and Lick Creek—an area that includes Camp Creek and its tributaries. As such, this plan provides a road map to complete nearly $1.8 million of high priority restoration actions within this focus area. Coupled with completed and ongoing aquatic restoration actions, this plan will significantly contribute to whole watershed restoration of the entire Camp Creek Watershed. From that point, the MFWG can shift its recovery efforts to other watersheds in the Middle Fork John Day Subbasin.

1 In 2005, private and public landowners and other local interests in the Middle Fork John Day River subbasin met and formed the Middle Fork Working Group (MFWG). The group is dedicated to cooperatively improving conditions that support healthy riparian areas, streams, and fish populations in the subbasin. The MFWG members include the Oregon Department of Fish and Wildlife (ODFW), Confederated Tribes of Warm Springs, The Nature Conservancy, Bureau of Reclamation, Grant County Soil and Water Conservation District, Oregon Trout, North Fork John Day Watershed Council, Oregon Water Trust, Malheur National Forest, and several private land owners.

TABLE OF CONTENTS

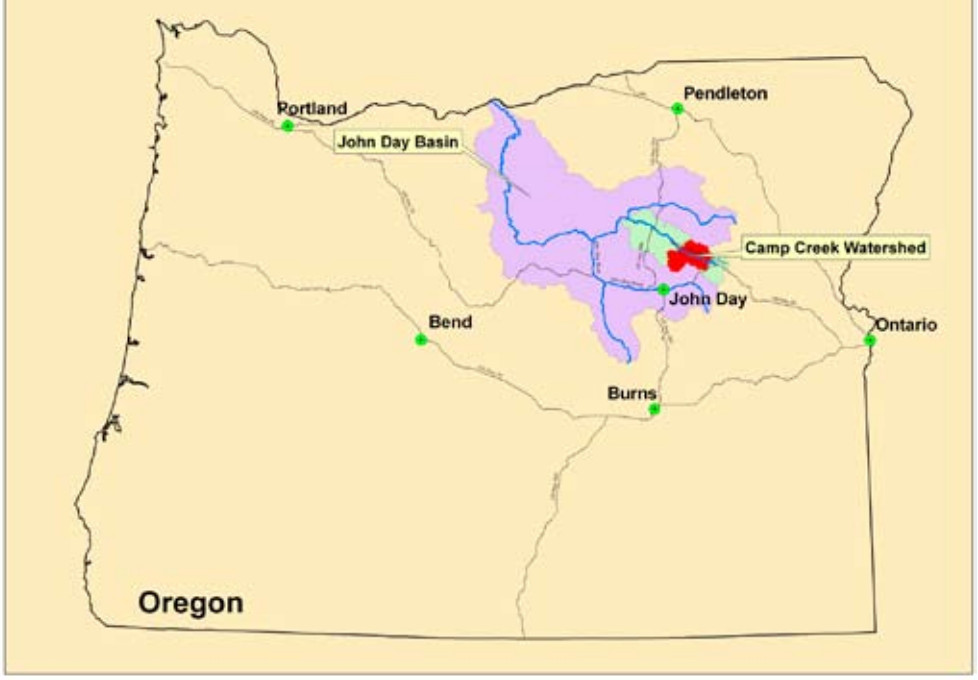
LIST OF FIGURES

LIST OF TABLES

BACKGROUND

In 2005, private and public landowners and other local interests in the Middle Fork John Day River subbasin met and formed the Middle Fork Working Group (MFWG). The group is dedicated to cooperatively improving conditions that support healthy riparian areas, streams, and fish populations in the subbasin. The MFWG members include the Oregon Department of Fish and Wildlife (ODFW), Confederated Tribes of Warm Springs, The Nature Conservancy, Bureau of Reclamation, Grant County Soil and Water Conservation District, Oregon Trout, North Fork John Day Watershed Council, Oregon Water Trust, several private land owners, and the Malheur National Forest. The MFWG has created this action plan for the Camp Creek Watershed—one of five 5th field watersheds in the subbasin—to guide implementation of high priority aquatic restoration recommendations listed in two regional recovery plans: Draft Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment (Recovery Plan [Carmichael 2007]) and the John Day Subbasin Revised Draft Plan (Subbasin Plan [CBMRC&D 2005]).

Figure 1. Camp Creek Watershed Location Map



The Camp Creek Watershed is located in rural northeast Oregon within the John Day River Basin and covers 125,938 acres. It is home to spring Chinook salmon, steelhead, bull trout, redband trout, and Pacific lamprey. The watershed can be attributed regional importance from the simple fact that it is situated in the John Day Basin, which is widely regarded as the last Columbia River basin to serve as a native salmon stronghold. There are two reasons for this designation. First, the John Day River is the longest free-flowing river in the Columbia Basin and second longest free flowing river in the 48 conterminous United States (CBMRC&D 2005), providing relatively unencumbered access to basin watersheds, such as Camp Creek. Further, the basin is relatively free of hatchery influences (Carmichael 2007), thereby supporting the last remaining intact wild spring Chinook and steelhead populations in the Columbia basin (CBMRC&D 2005). Consequently, the Wild Salmon Center has designated the John Day River as "the Columbia Basin's most biologically diverse river system and a globally important stronghold of wild salmon" (www.wildsalmoncenter.org).

Even still, the John Day Basin spring Chinook salmon and steelhead numbers are considerably lower than what was thought to occur historically. For instance, spring Chinook numbers have dropped from as many as 40,000 adult spawners to approximately 5,500, while steelhead have declined from 70,000 to about 18,000 (CBMRC&D 2005). In the Middle Fork John Day River, spring Chinook numbers have

declined from about 7,500 adult spawners to under 1,000, while steelhead have plummeted from approximately 11,000 (CBMRC&D 2005) to less than 1,000 fish (Carmichael 2007). Both the John Day spring Chinook salmon and steelhead are part of the Middle Columbia (MC) Chinook and steelhead populations—which inhabit Columbia River tributaries in Oregon and Washington upstream of the Hood River and Wind River systems and up to and including the Yakima River, while not including the Snake River. The MC steelhead numbers have declined to such a degree throughout its range that the National Marine Fisheries Service (NMFS) listed the species as Threatened under the Endangered Species Act (ESA) in 1999 (NMFS 1999).

To address this sharp decline of salmon and steelhead numbers, the state of Oregon, NMFS and Northwest Power and Conservation Council (NWPCC) have developed large-scale recovery plans. The NMFS is providing oversight to the Recovery Plan (Carmichael 2007), which is being developed by the State of Oregon. Second, the Subbasin Plan (CBMRC&D 2005) is one of 62 plans throughout the Columbia Basin intended to guide the NWPCC Fish and Wildlife Program in its requirement to mitigate for fish and wildlife losses resulting from Columbia River hydropower dams. The steelhead Recovery Plan (Carmichael 2007) rated the Camp Creek Watershed (5th field HUC) as a high priority for habitat protection and restoration in the Middle Fork John Day River subbasin while the Subbasin Plan (CBMRC&D 2005) listed Camp Creek as the highest priority watershed.

Both plans identified limiting factors to guide restoration in the Camp Creek Watershed. The Recovery Plan (Carmichael 2007), for instance, identified limiting factors for steelhead in the Camp Creek Watershed: altered hydrology and sediment routing, along with degraded floodplains, riparian communities, stream channel structure, and water quality (temperature). The Subbasin Plan (CBMRC&D 2005) listed limiting factors that apply to both steelhead and spring Chinook salmon: habitat diversity, sediment loads, stream temperatures, and key habitat quantity. Flow was an additional limiting factor specifically identified for spring Chinook salmon (CBMRC&D 2005), primarily in the mainstem Middle Fork John Day River. Further, both plans identify culverts and other fish passage barriers as a major threat to fish production in the Camp Creek Watershed. These limiting factors help to direct priorities and restoration projects, and if successfully addressed, the productivity and abundance of steelhead and spring Chinook salmon can be increased (CBMRC&D 2005). Table 1 links limiting factors with restoration actions.

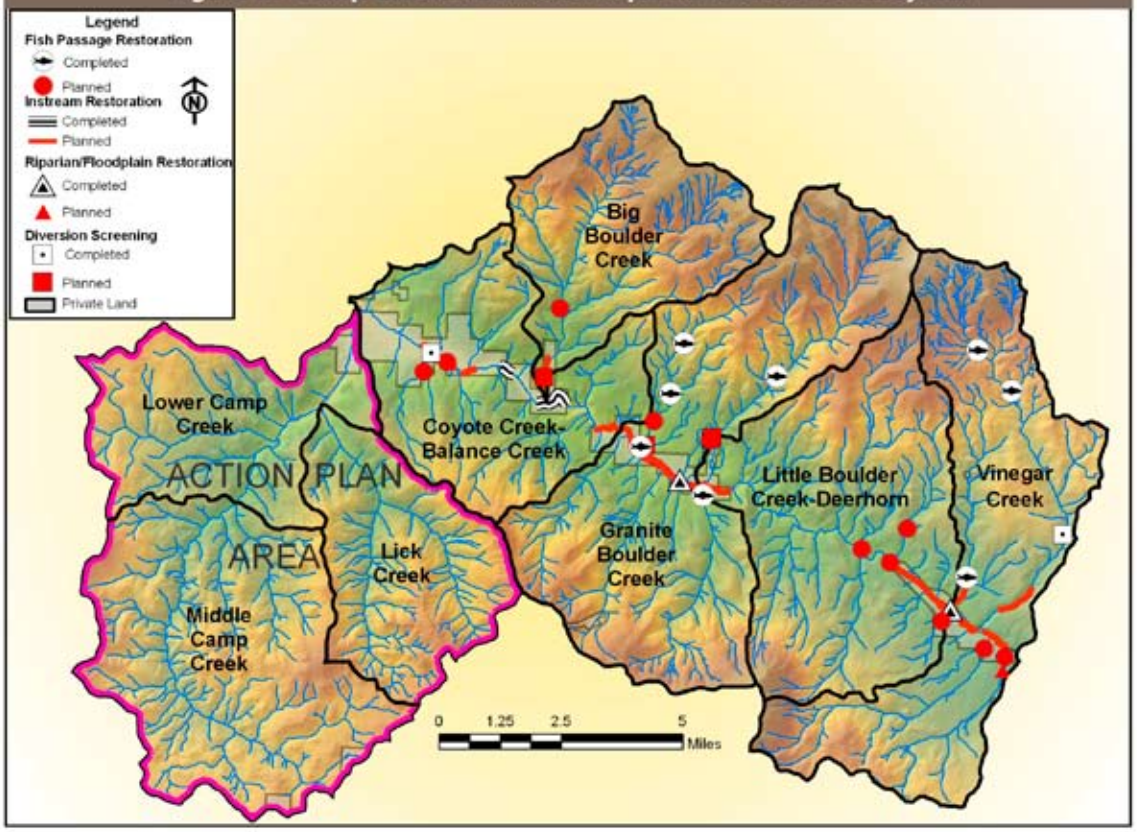
Table 1. Limiting Factors and Restoration Activities

Limiting Factor	Restoration Activities
Fish Passage Barriers	Remove or replace priority barriers, provide screens on diversions, etc.
Altered Hydrology and Sediment Routing	Improve road drainage, decommission roads, disconnect road drainage from streams, etc.
Degraded Floodplains, Riparian Communities, Stream Channels (habitat diversity/quantity), and Water Quality	Riparian restoration; remove exotics, log weirs, railroad berms, and road barriers
Flow (mainstem Middle Fork John Day River)	Protect instream flow

PURPOSE

In response to the Recovery Plan (Carmichael 2007) and Subbasin Plan (CBMRC&D 2005), the Malheur National Forest and MFWG partners have created this restoration action plan, which identifies and prioritizes site-specific restoration activities that directly address limiting factors in the Camp Creek Watershed.

Figure 2. Camp Creek Watershed Aquatic Restoration Projects



The Camp Creek Watershed is comprised of eight 6th field subwatersheds. Five subwatersheds contain tributary streams that are inherently stable, characterized by cooler water temperatures and quality fish habitat, and thus areas of degraded habitat were relatively few and readily visible. These subwatersheds include Coyote Creek–Balance Creek, Big Boulder Creek, Granite Boulder Creek, Little Boulder Creek–Deerhorn, and Vinegar Creek. As such, the initial aquatic restoration actions identified by the MFWG were and continue to be focused in these five subwatersheds. Some prominent restoration actions include extensive channel, riparian, and floodplain restoration projects on the mainstem Middle Fork John Day River on lands owned by the Confederated Tribes of Warm Springs and the Nature Conservancy, as well as numerous fish passage projects throughout tributary streams on private and National Forest System lands. Refer to Figure 2. Because priority aquatic restoration projects in these five watersheds have been completed, are ongoing, or will be completed within the next 2-5 years, the remaining three 6th field subwatersheds—Lower Camp Creek, Middle Camp Creek, Lick Creek—will be the focus of this action plan.

These three focus subwatersheds, a 40,294 acre area containing Camp Creek and its tributaries, include numerous low-gradient stream reaches that have been heavily impacted by past management activities yet have high potential to provide quality fish habitat. Therefore, this action plan represents a final step in identifying and prioritizing the remaining restoration projects required to address the most significant limiting factors in the Camp Creek Watershed. In doing so, this plan sets the stage for whole watershed restoration, defined as restoring (within existing biological and social constraints) the natural habitat forming processes under which native fish evolved (Lichatowhich et. al. 1995; Reeves et. al. 1995; Roni et. al. 2002), thus bringing the Camp Creek Watershed in alignment with aquatic habitat goals described in the Recovery Plan (Carmichael 2007) and Subbasin Plan (CBMRC&D 2005).

FRAMEWORK FOR CAMP CREEK WATERSHED ACTION PLAN

The MFWG used a watershed assessment manual developed for Oregon (WPN 1999) and a restoration prioritization approach developed for the Pacific Northwest (Roni et al. 2002) to tailor a Seven-Step Approach for the Camp Creek Watershed Action Plan.

The Oregon Watershed Assessment Manual (WPN 1999) provides a process to assist Oregon-based community groups to develop an understanding of watershed processes and conditions affecting their watershed. The manual provides tools to compare current conditions with historic conditions in an effort to identify the factors that are affecting watershed function. To address limiting factors, priority is given to restoration projects that protect stream reaches that currently provide high quality fish habitat, followed by restoration of stream reaches that have potential to provide high quality habitat. The manual recommends that monitoring be conducted to evaluate conditions where information is not available and to determine whether projects that were implemented meet restoration objectives.

Roni et al. (2002) offers a specific approach for prioritizing restoration projects in Pacific Northwest watersheds. The first step is to protect known quality habitat. Second, aquatic restoration practitioners are encouraged to complete a watershed assessment to identify projects that restore watershed processes essential for the creation and maintenance of quality fish habitat. Project categories are prioritized in the following order: 1) fish passage restoration because such projects provide immediate access to historic habitat and can last many decades; 2) restore hydrologic, geologic (sediment delivery and routing), riparian, and upslope processes through projects, such as road decommissioning; 3) instream restoration projects, such as large wood placement, which are best implemented after or in conjunction with reconnection of isolated habitats and projects to restore watershed processes. Finally, Roni et al. (2002) recommends that restoration projects be evaluated to determine their adequacy in meeting objectives.

The MFWG used these two documents to tailor a Seven-Step Approach for this action plan. Step 1 describes the life history patterns of MC Steelhead and spring Chinook salmon that inhabit Camp Creek and its tributaries, providing context for steps 2 through 7. Steps 2 through 5 provides summary results of watershed assessments and the best available professional knowledge, providing justification for protective measures (Step 2), fish passage projects (Step 3), upland treatments (Step 4), and riparian, floodplain, and channel projects (Step 5). Step 6 provides a prioritized list of site-specific actions—taken from recommendations listed in Steps 2 through 5—along with cost estimates required to complete whole watershed restoration. Finally, Step 7 presents a monitoring strategy to assess the effectiveness of proposed projects.

STEP 1 — **Life Histories of MC Steelhead and Spring Chinook Salmon that Inhabit Camp Creek**

STEP 2 — **Measures and Recommendations to Protect Fish Habitat**

STEP 3 — **Assessment and Recommendations for Fish Passage***

STEP 4 — **Assessment and Recommendations for Upland Processes (Vegetation and Roads)***

STEP 5 — **Assessment and Recommendations for Riparian Vegetation, Floodplain and Stream Channel Processes, and Water Quality***

STEP 6 — **Project Rankings and Cost Estimates to Complete Whole Watershed Restoration**

STEP 7 — **Adaptive Management Monitoring**

* Detailed assessments for Steps 3-5 are available upon request. Contact Tom Friedrichsen at tfriedrichsen@fs.fed.us

STEP 1 – LIFE HISTORIES OF MC STEELHEAD AND SPRING CHINOOK SALMON THAT INHABIT CAMP CREEK

OVERVIEW FROM THE RECOVERY PLAN AND SUBBASIN PLAN — These plans include useful and general information on the taxonomy and life history patterns of MC Steelhead and/or spring Chinook salmon, providing a basis for limiting factor assessments. This action plan includes information on specific ways in which steelhead and spring Chinook salmon use Camp Creek and its tributaries, information provided by the Oregon Department of Fish and Wildlife (ODFW).

SPECIES DESCRIPTION — Since the 1960s, ODFW staff from the John Day District Office has monitored steelhead and salmon in the Middle Fork John Day subbasin and Camp Creek. These staff provided information for this action plan, which includes many facts as to the way MC Steelhead and spring Chinook salmon use Camp Creek and its tributaries. Refer to Figure 3 for fish distribution within the action plan area.

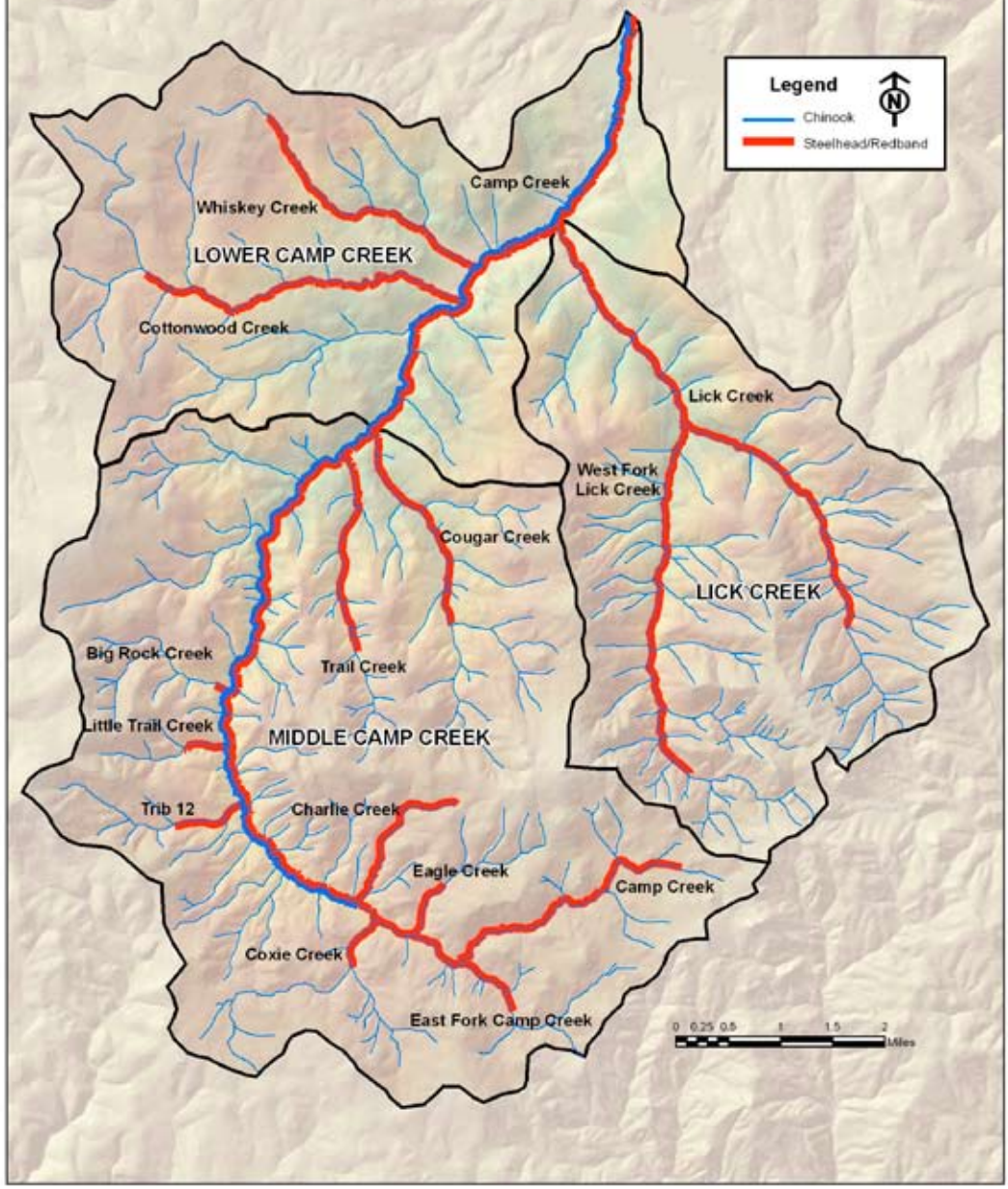
Summer Steelhead — The MC Steelhead are summer steelhead in that adults enter the Columbia River from the Pacific Ocean during the summer months—June and July—and typically enter the lower John Day River in late September or early October as water temperatures drop and flows increase. They slowly migrate upriver before reaching their spawning grounds, where spawning begins in April (lower tributaries) and continues through early June (headwater tributaries). In Camp Creek, spawning typically peaks in early-May, but adults on redds have been seen in late May. Eggs are deposited in the gravel, where they incubate for about 45 days, depending upon water temperature. If water temperatures average less than 50˚ F, incubation will take longer than 45 days. If temperatures average more than 50˚ F, incubation takes less than 45 days. Fry emergence from the gravel is typically over by mid-July. (Hence, the in-water work period starts July 15.) Juveniles reside in freshwater for 1 to 3 years before migrating to the ocean (most often at age 2), although some have been known to stay for up to 5 years in freshwater. Of note, juvenile steelhead and resident redband trout are virtually impossible to differentiate except through otolith analysis.

During their freshwater phase, juvenile steelhead in the John Day Basin may move throughout a watershed, seeking the best habitat. The ODFW does not have juvenile migration data for fish in the Middle Fork but does for the South Fork. In good habitat, they tend to stay put until reaching smolt size. In stream reaches where water temperatures are marginal, juveniles move long distances to locate cool-water refugia. If behavior is similar for juveniles in Camp Creek, fish would reside in or move to stream reaches with good water quality. After reaching about 6-7 inches, juvenile steelhead proceed through a physiological change (smolt) and migrate to the ocean with peak downstream movement in mid-May. Adults spend 1 to 2 years in the ocean before returning to the mouth of the Columbia River in mid-June to repeat the cycle. Steelhead can spawn multiple times, assuming they survive the 1,000-mile round trip more than once.

Spring Chinook Salmon — The MC Chinook salmon are spring Chinook, meaning that they leave the ocean as adults and enter the Columbia River during the spring months—March to May. They reach the John Day in peak numbers during mid-May, working their way upstream about 20 miles each day until they reach summer holding areas in the Middle Fork in late June and early July. After several months, the adults form pairs and spawn in the mainstem Middle Fork in late September. From there,

eggs incubate in the gravel, and fry emerge by mid-to-late May. Juvenile Chinook spend the first few months in the mainstem, but once stream temperatures begin to rise (above 75˚ F), they usually move into cool reaches of the mainstem or tributary streams, including Camp Creek and its tributaries. Juvenile Chinook use at least the lower 12 miles of Camp Creek, spending the remainder of the summer in cool stream reaches. They move into the Middle Fork as temperatures start to drop in the fall, usually in late September or early October. Once they are in the Middle Fork, they gradually migrate downstream. Peak migration past ODFW seining sites near Spray (River Mile 170) occurs in mid April, and it typically takes another 20 days for them to arrive at the Pacific Ocean.

Figure 3. Camp Creek Watershed Fish Distribution



RECOMMENDATIONS — Moser and Close (2003) document that Pacific lamprey spawn and rear throughout the Middle Fork John Day River. It is not clear, however, as to whether or not this fish inhabits Camp Creek. Therefore, it is recommended to survey for Pacific lamprey presence in Camp Creek, whereby results can better guide management practices in the watershed.

STEP 2 – MEASURES AND RECOMMENDATIONS TO PROTECT FISH HABITAT

OVERVIEW FROM THE RECOVERY PLAN AND SUBBASIN PLAN — The Camp Creek Watershed was listed as high priority for both protection and restoration in both plans. Carmichael (2007) wrote that management actions should provide long-term protection of habitat conditions that support viable populations. The Subbasin Plan states that protecting high quality fish habitat is needed to prevent deleterious changes and is essential to maintain and improve fisheries habitat (CBMRC&D 2005). This action plan describes current protective measures and recommendations for increased protection of habitat in the action plan area.

ASSESSMENT AND DISCUSSION OF PROTECTIVE MEASURES IN THE ACTION PLAN AREA — Ninety-nine percent of the lands in the action plan area are National Forest System Lands and have been managed under the Interim Strategies for Managing Anadromous Fish-Producing Watersheds on Federal Lands in Eastern Oregon and Washington, Idaho, and Portions of California, commonly referred to as PACFISH (USDA and USDI 1995b). The PACFISH strategy provides management direction to ensure the protection and eventual restoration of streams, rivers, lakes, wetlands, and adjacent riparian areas through the designation of Riparian Habitat Conservation Areas (RHCAs). Simply put, a RHCA equates to a special management area along streams and lakes, and all Forest Service activities in RHCAs are regulated in a manner that leads to maintenance or improvement of riparian functions. These special management areas are applied to the 186 miles of streams in the action plan area—300'on either side of fish-bearing streams, 150' on either side of perennial non fish-bearing streams, and 100' on either side of intermittent non fish-bearing streams. As such, timber harvest, road construction, improper grazing, or any other management action that does not maintain or improve riparian area conditions is not permitted within these areas. Refer to Figure 4.

On National Forest System Lands, the only current management practice that can be improved in limited locations is grazing, and a watershed assessment identified several areas in which grazing could be better managed to maintain and improve riparian conditions (based on 2004 stream inventory notes and data). Those areas where grazing impacts were most noticeable include upper Camp Creek, Coxie Creek, East Camp Creek, and Cottonwood Creek. It should be noted, however, that the associated high bank stability in the action plan area does not suggest a pattern of widespread streambank degradation and sediment inputs. Refer to Step 5. Protective measures for livestock appear to be adequate on the remainder of the stream reaches, again referring only to the 2004 grazing season.

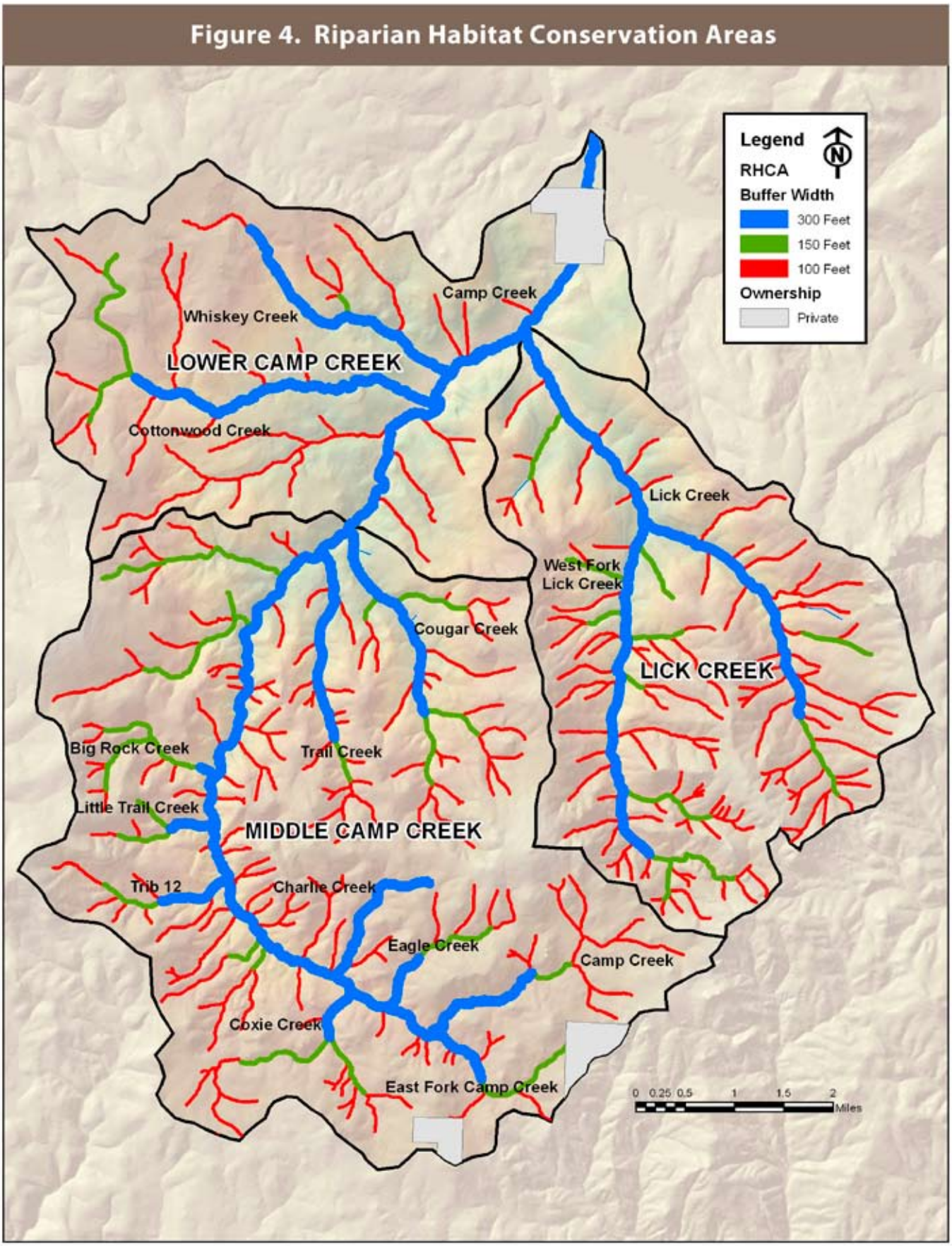
Legacy impacts from management actions that occurred prior to the implementation of PACFISH are addressed in Steps 3 through 5. Such actions include culvert installations that created fish barriers, streamside road construction, timber harvest, construction of railroad berms along stream channels, and installation of improperly placed channel structures.

RECOMMENDATIONS — To ensure compliance with PACFISH, implementation and effectiveness monitoring will be conducted for livestock grazing activities.

- **Conduct annual implementation monitoring** to determine if livestock management is being applied as prescribed and that effects of grazing do not carry through to the next year.

- **Conduct effectiveness monitoring** (conducted every five years) to determine whether or not grazing practices are maintaining or restoring the desired riparian vegetation structure and function, streambank stability, and channel morphology.

Figure 4. Riparian Habitat Conservation Areas



STEP 3 – ASSESSMENT AND RECOMMENDATIONS FOR FISH PASSAGE

OVERVIEW FROM THE RECOVERY PLAN AND SUBBASIN PLAN — Both plans identified culverts and other passage barriers as a major threat to steelhead and/or spring Chinook salmon production in the Camp Creek Watershed. The Subbasin Plan states that removal of fish passage barriers in the Camp Creek Watershed is a "Very High" priority because such projects restore access to previously inaccessible habitat for use by steelhead and salmon, making it easier for fish to find refuge areas during times of low water and high temperatures. The current versions of both plans, however, do not provide site-specific information on fish passage barriers for the Camp Creek Watershed. Thus, a detailed fish-passage barrier assessment was completed for the action plan area.

CULVERT ASSESSMENT RESULTS AND DISCUSSION — Malheur National Forest staff conducted culvert surveys on fish bearing streams throughout the action plan area and identified 34 culverts that were considered barriers to one or more life stages of fish. Numerous culverts were passable to adult steelhead and salmon but none were accessible to juveniles. Furthermore, these culverts presented barriers to juvenile and/or adult passage throughout the entire stream network. For these reasons, the action plan area was rated as ***Functioning Inappropriately*** for fish passage, using the following rating system:

Functioning Appropriately — All culverts are passable.
Functioning-at-Risk — When a culvert is a barrier in the middle to upper reaches of a watershed.
Functioning Inappropriately — When a culvert is a barrier in the lower reaches of a watershed.

Of the 34 culverts, 20 were determined to be a high priority for removal or replacement based on the quality and quantity of habitat upstream of the culvert. Habitat quality was based on fish distribution data, stream flow, streambed substrate, habitat complexity, and gradient. These culverts are located on the following streams: Camp, Lick, West Fork Lick, Cougar, Cottonwood, Coxie, Big Rock, Little Trail, and Eagle creeks. Twelve of the culverts had been retrofitted in the past with log-weir structures, creating step pools up to the culvert outlet in order to correct passage problems. The presence of these weirs will add an additional level of complexity when designing the removal or replacement plans for these culverts.

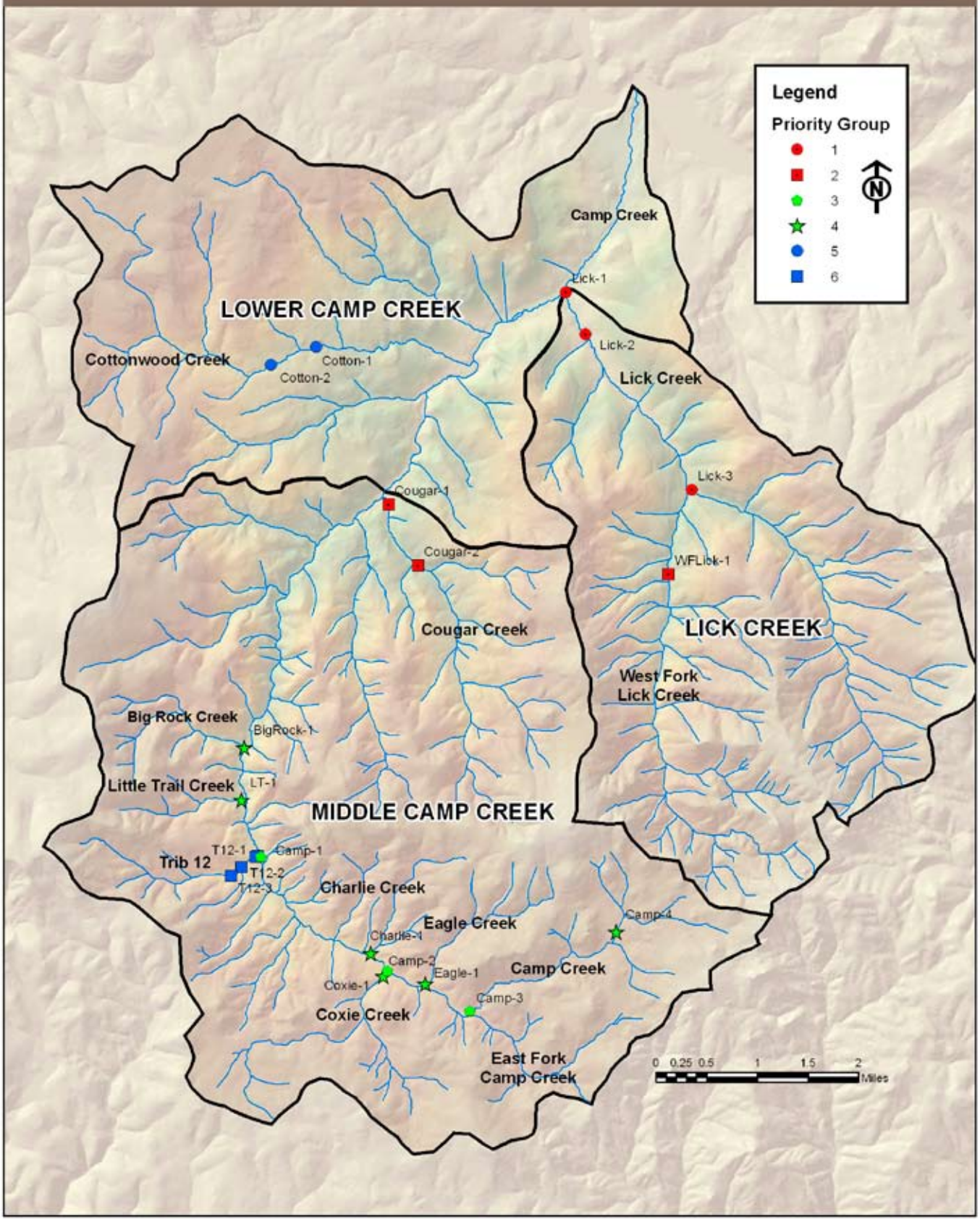
RECOMMENDATIONS TO RESTORE FISH PASSAGE — Malheur National Forest staff and ODFW fisheries biologists (Tim Unterwegner and Jeff Neal) reviewed watershed assessment information and field notes to rank the removal or replacement of the 20 high priority culverts in the action plan area. The rankings were based on life history needs of steelhead and spring Chinook salmon.

- **Remove migration barriers that prevent movement of juvenile steelhead and spring Chinook salmon** from Camp Creek into summer thermal refugia areas (cool-water tributaries). The highest priority culvert projects occur in Lick and Cougar creeks, as they provide some of the best juvenile rearing habitat (e.g., cool water refugia during summer months).

- **Remove migration barriers for adult steelhead and chinook in spawning areas.**

Refer to Figure 5 for location and prioritization of the 20 culvert removal and replacement projects, all of which **reconnect just over 25 miles of habitat** within the action plan area.

Figure 5. Planned Aquatic Organism Passage Activities



STEP 4 – ASSESSMENT AND RECOMMENDATIONS FOR UPLAND PROCESSES (VEGETATION AND ROADS)

OVERVIEW FROM THE RECOVERY PLAN AND SUBBASIN PLAN — The Recovery Plan identified altered hydrology and sediment routing as limiting factors in the Camp Creek Watershed (Carmichael 2007), and such limiting factors are strongly influenced by upland conditions. As stated in the Subbasin Plan "Upland improvement projects are those projects that are not in or directly adjacent to established stream courses. Upland improvements can be obtained through vegetative, structural, or management activities and are designed to improve water quality and overall watershed health." These projects generally aim to filter pollutants (e.g. chemicals, nutrients, sediment), reduce erosion, increase the infiltration of precipitation and/or recharge groundwater aquifers, and more (CBMRC&D 2005). Both recovery plans mentioned roads and fire suppression as disturbance factors within the watershed. Fire suppression results in overstocked forests and an increased risk of stand replacement fires. Because current versions of the plans do not provide site-specific recommendations for upland vegetation and road projects, this document provides such information for the action plan area.

UPLAND VEGETATION ASSESSMENT RESULTS AND DISCUSSION — Within the 40,294 acre action plan area, forest lands cover approximately 92% of the landscape. Eighty percent of the forested area is overstocked, meaning that conifer stands contain higher densities of trees relative to historic benchmarks, heightening the forest's susceptibility to insects and disease. Nearly 50% of the stands are so dense that they are highly to extremely susceptible to crown fire. Refer to Figure 6. In addition, 54% of the forested acres lack old growth trees and contain an over abundance of mid-seral stands relative to historic conditions. Approximately 7% of the forested lands are classified as seedling/sapling sites with remnant seed/shelter trees left from previous timber harvests. Conifers (including junipers) have expanded into meadows and riparian areas throughout the watershed and have displaced or compete with willows, aspen, cottonwood, and alder. All of these factors may be contributing to lower base flows within the watershed, but the extent is unknown.

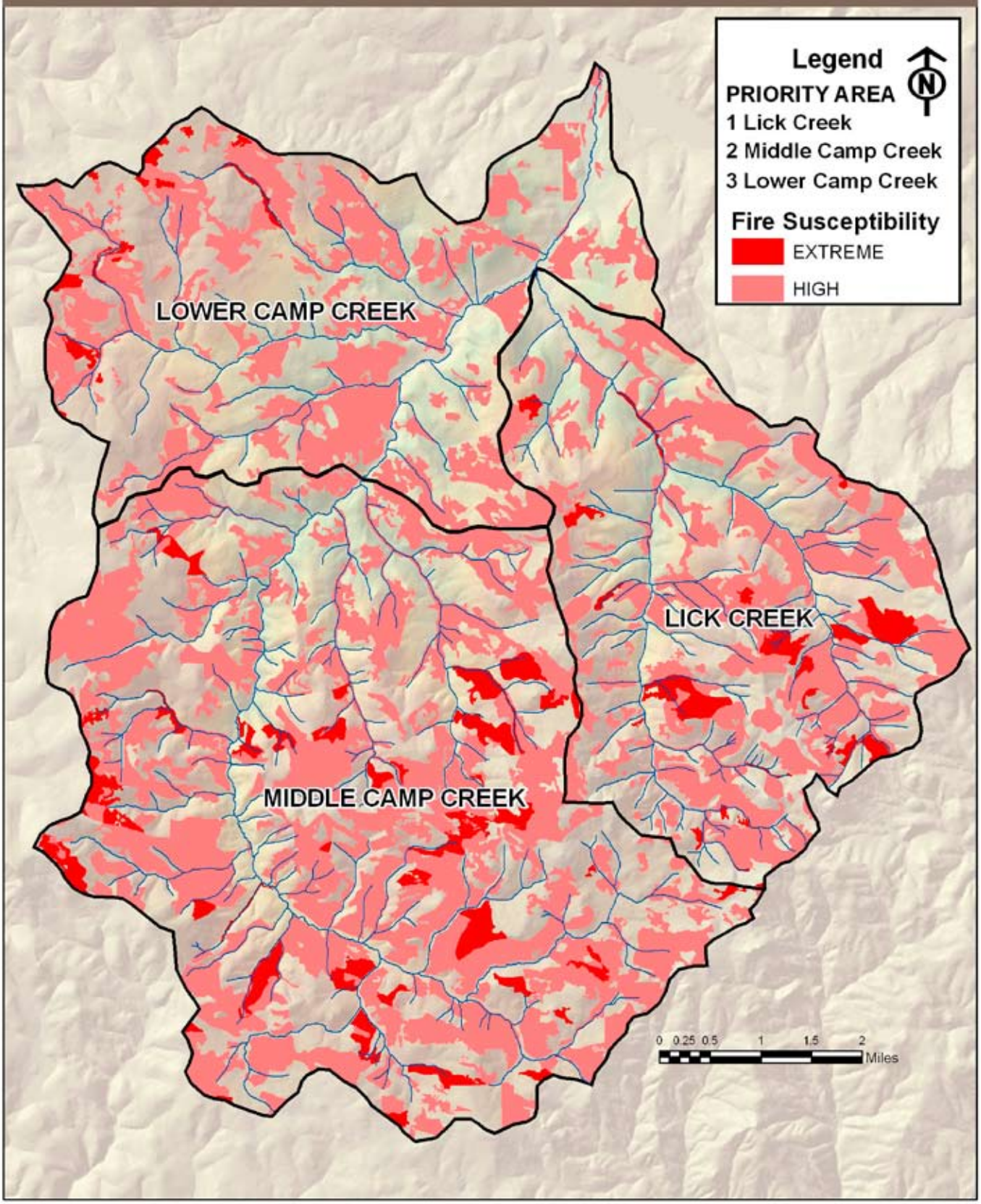
One-hundred years of fire suppression has promoted the abundance of overstocked stands that are currently unable to accommodate historic fire regimes characterized by low intensity, frequent fires (7-30 year cycle). The low abundance of old growth and high abundance of early/mid seral stands is due to past timber harvest, associated tree planting, and subsequent growth of seedlings into mid-seral stands. Based on this information, the upland vegetation element receives a **Functioning-at-Risk** rating for the entire action plan area. This rating is based on the following:

Functioning Appropriately — Forested communities are within the Historical Range of Variability (HRV); stand densities and species composition are maintained by low intensity, frequent fires; openings account for approximately 5-20% of the watershed; there is insignificant conifer and/or juniper encroachment into grasslands, shrublands, and/or hardwoods.

Functioning-at-Risk — Some forest communities are outside of the HRV; stand densities and species composition of some stands are at moderate risk to crown fire; openings are either below or above the historical ranges (typically 5-20%); there is moderate conifer and/or juniper encroachment into grasslands, shrublands, and/or hardwoods.

Functioning Inappropriately — Most forested communities are outside of the HRV; stand densities and species composition are at high to extreme risk to crown fire; openings account for more than 20% of the watershed; there is high conifer and/or juniper encroachment into grasslands, shrublands, and/or hardwood communities.

Figure 6. Proposed Thinning Activities



UPLAND ROADS ASSESSMENT RESULTS AND DISCUSSION — There are 355 miles of roads within the 40,294 acre action plan area, most of which were constructed to provide access for timber harvest and subsequent tree planting. Even though 37 miles of road have been decommissioned, the road density remains high at 5.6 mi/mi². Consequently, the watershed is **Functioning Inappropriately** when compared to desired road densities. This rating is based on the following criteria:

Functioning Appropriately — Road density less than 1.7 mi/mi², the desired (target) condition
Functioning-at-Risk — Road density of 1.7 – 4.7 mi/mi²
Functioning Inappropriately — Road density greater than 4.7 mi/mi²

Road and stream interactions within the action plan area are high. For instance, one third of all roads are in close proximity (within 200 feet) to stream channels. Along with the 186 miles of stream channels within the action plan area, an estimated 202 of the 355 miles of roads are hydrologically integrated with the stream network, thus increasing the drainage network by 109%. (This calculation was based on a Wemple et al. [1996] study.) Consequently, these hydrologically connected roads have the potential to contribute water and sediment to streams channels, which may result in higher peak-flow events and an increase of sediment into stream channels.

Survey data identified 63 miles of road within the action plan area that have erosion concerns, all of which are addressed in the recommendations below. A geographic information system analysis completed from a Camp Creek Road Analysis indicates that 15.4 miles of these roads are located within 200 feet of fish-bearing streams. Roads identified as having observable erosion that are near fish-bearing streams include 1800765, 3600, 3600686, 3600738, 3600840, 3640733, 3650, 3650191, 3650411, 3650428, 3650478, 3670633 and 3670803. Of note, road induced landslides are not a significant issue within this watershed.

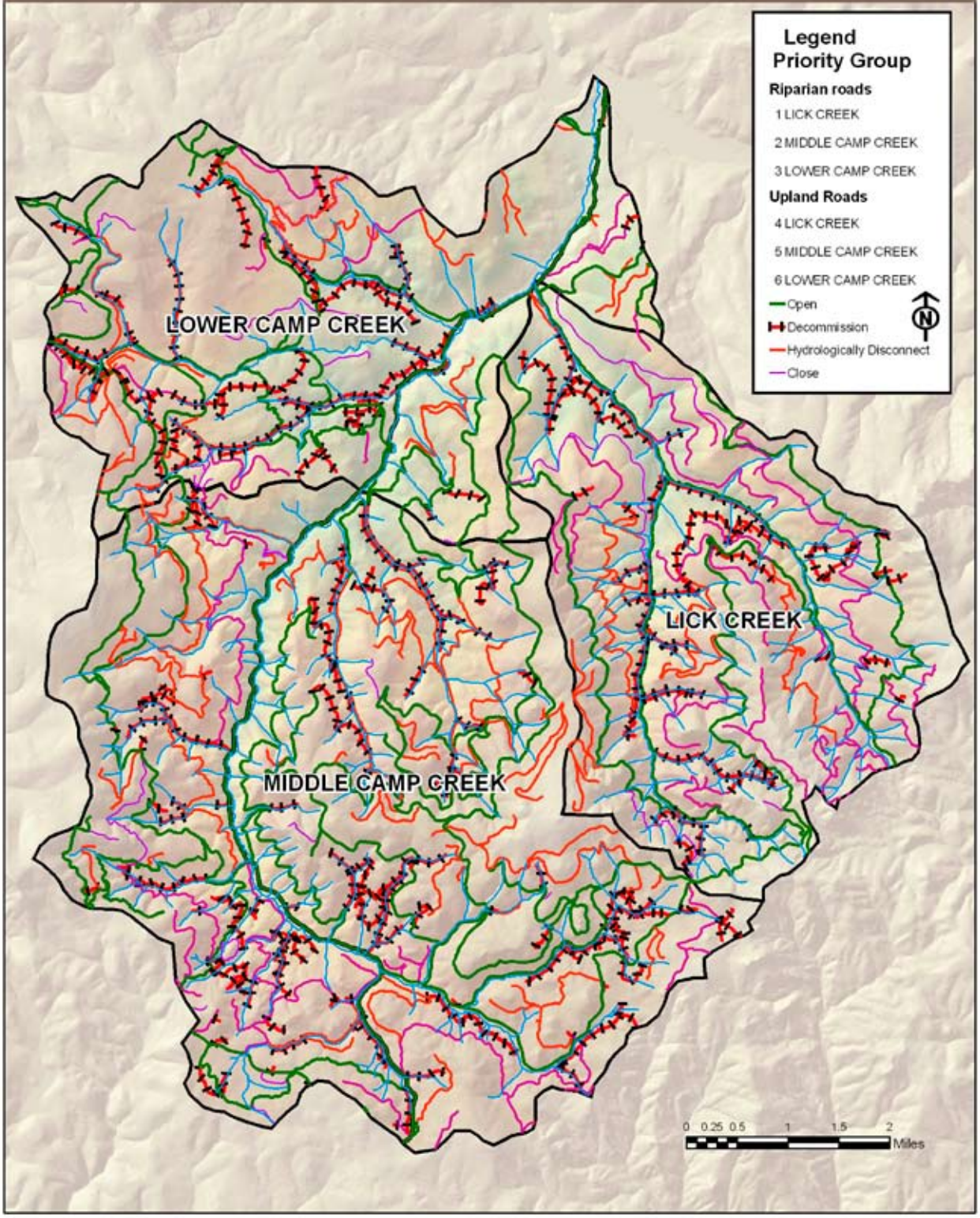
RECOMMENDATIONS TO RESTORE UPLAND PROCESSES — Recommendations to improve upland conditions should be prioritized as follows, in decreasing order of importance:

- **Decommission and/or hydrologically disconnect 54 miles of roads** within close proximity (within 200' of stream) to juvenile steelhead and spring Chinook summer thermal refugia and adult spawning grounds, with priority given to Group 1 (8 miles of road in the Lick Creek subwatershed), then Group 2 (35 miles of road in the Middle Camp Creek subwatershed), and finally Group 3 (11 miles of road in the Lower Camp Creek subwatershed).
- **Decommission and/or hydrologically disconnect 75 miles of roads** that are greater than 200' away from streams, with priority given to Group 4 (16 miles of road in the Lick Creek subwatershed), then Group 5 (42 miles of road in the Middle Camp Creek subwatershed), and finally Group 6 (17 miles of road in the Lower Camp Creek subwatershed).
- **Properly drain open roads, primarily those within 400' of streams,** to reduce hydrological connections to stream channels. Focus on the following roads: 1800765, 3600, 3600686, 3600738, 3600840, 3640733, 3650, 3650191, 3650411, 3650428, 3650478, 3670633 and 3670803.
- **Thin forest understories to within HRV** to reduce risk of catastrophic fire to protect spawning and rearing areas. Priority areas for thinning are ranked in the following order: Lick Creek subwatershed, Middle Camp Creek subwatershed, Lower Camp Creek subwatershed. Coordinate thinning projects with road decommissioning activities to provide access to thinning units. Additional analysis is required for site-specific recommendations.

- **Thin conifers to provide growing space for hardwoods.** Where aspen sprouting is not occurring, stress mature aspen trees through full or partial girdling or prescribed fire. Where vigorous sprouting or germination is occurring, protect plants through fencing or caging.
- **Reduce juniper distribution and densities to match HRV.**

Refer to Figures 6 and 7.

Figure 7. Proposed Road Activities



STEP 5 – ASSESSMENT AND RECOMMENDATIONS FOR RIPARIAN VEGETATION, FLOODPLAIN AND STREAM CHANNEL PROCESSES, AND WATER QUALITY

OVERVIEW FROM THE RECOVERY PLAN AND SUBBASIN PLAN — The Subbasin Plan (CBMRC&D 2005) summarizes the benefits of riparian areas in that they protect stream banks from excessive erosion, maintain appropriate channel forms, store water in floodplain aquifers, buffer overland sources of sediment, and provide cover and food for fish. The plan listed associated restoration categories, such as vegetation management, removal of structures that confined floodplains, beaver management, and in-channel restoration actions. The Recovery Plan (Carmichael 2007) identified limiting factors that curtailed steelhead production in the Camp Creek Watershed: degraded riparian communities, floodplain connectivity and function, channel structure and complexity, water quality (stream temperature), altered hydrology, and sediment routing, all of which are integrally related. The plan even went as far as to identify log-weirs placed in Camp Creek as specific items which need to be addressed. The plans, however, do not provide site specific information on limiting factors related to riparian vegetation, floodplain function, and stream channel processes for the Camp Creek Watershed. Thus, a more detailed assessment of these factors along with restoration recommendations was completed for the action plan area.

STREAM ASSESSMENT RESULTS AND DISCUSSION — Just over 38 miles of stream were surveyed within the action plan area: Middle Camp subwatershed with 16.3 miles (Camp Creek, 12.8 miles; E. Fk. Camp Creek, 2.1 miles; and Coxie Creek, 1.4 miles); Lower Camp subwatershed with 10.7 miles (Camp Creek, 5.2 miles; and Cottonwood Creek, 5.5 miles); and Lick Creek subwatershed with 11.4 miles (Lick Creek, 6.4 miles; and W. Fk. Lick Creek, 5.0 miles). The following is a short summary of riparian, floodplain, and stream channel conditions and water quality within the action plan area.

Riparian Vegetation — Throughout the watershed, stream surveys documented the appropriate types of riparian vegetative communities required for both maintenance and recovery of desired site characteristics. For instance, meadow areas were dominated by rush, sedge, and mesic grasses, along with scattered alder, willow, red osier dogwood and/or other shrub species. Forest reaches were typically characterized by a mature overstory of trees (Douglas fir, ponderosa pine, western larch, lodgepole pine) that serve as adequate sources of in-stream large woody material.

In general, riparian vegetation was comprised of those plants or plant community types having root masses capable of withstanding high streamflow events and protecting streambanks, ascribing to high bank stability values. (Average bank stability values ranged from 88-100% for all streams surveyed.) Along some of the meadow reaches, however, large alder and willows are lacking and thus do not have the adequate age-class distribution needed in order to meet desired vegetation conditions. Also, only limited cottonwood regeneration was noted along stream channels throughout the watershed. Managing for a more diverse age-class of riparian vegetation will provide the necessary food source for beaver, a keystone species in the low gradient reaches. As noted in Step 4, numerous riparian/adjacent upland plant communities exhibit high to extreme fire susceptibility ratings, albeit these conditions have a relatively patchy distribution over the watershed.

Floodplain — Railroad berms confine the channel in the lower portion of Camp Creek (reaches 1, 3, and 4) as well as reach 2 of Cottonwood Creek. Even though the legacy berms occur at limited locations, they confine channels that would otherwise meander freely across wide valley bottoms. Essentially, the berms straighten stream channels, reduce sinuosity and associated pools, resulting in fewer quality spawning areas. The berms confine the channel and peak flows, resulting in higher stream energies that could transport spawning gravels out of Camp Creek.

Stream Channels — The stream surveys documented a lack of pools, spawning substrates, large wood in forested settings, and legacy impacts from log structures, railroad grades/berms, valley-bottom roads, and grazing. The legacy impacts—primarily log structures, railroad berms and to a lesser degree valley-bottom roads—have confined stream channels and limited their ability to provide high quality habitat. For example, 230 log structures are distributed across 8 stream reaches in Camp and Lick creeks. Initially, these structures likely met the original intent of creating pools. However, there were many adverse and unforeseen consequences, such as a significant increase in width/depth ratios. For instance, in the lower reaches of Camp Creek (reaches 1-5) width/depth ratios ranged from 22-36, approaching double the expected values. In addition, the stream has undercut many structures, leaving the wood disconnected from the stream at low flow. In unconfined floodplains, the log structures prevent the channel from attaining higher levels of sinuosity and a classic pool/riffle sequence. The subsequent lack of pools—which provide essential rearing habitat—limits fish production. The magnitude and extent of this problem is evidenced by pool numbers being moderately to significantly lower than what would be expected under natural conditions. Furthermore, pool tail-outs associated with typical pool/riffle systems are lacking and could be a primary reason for there being low numbers of spawning sites.

Water Quality — Camp Creek from its mouth to river mile 15.6 is included on the Oregon Department of Environmental Quality "303(d) list" for exceeding stream temperatures optimal for fish rearing. Shading values for 66% of the stream miles surveyed within the action plan area were found to be within the range of values for similar streams in eastern Oregon (same width and riparian community) that are at or near site potential conditions (McNamara et al. 2000).

The lower reaches of Camp Creek (reaches 1, 3, 4, 5, 7, and 8) were identified as being below expected shade values and should be the focal areas for planning efforts to recover shade/water quality. Several of the stream reaches with high stream temperatures occur in or downstream of low gradient meadow reaches and have been affected by one or more factors influencing stream temperatures: high width/depth ratios, loss of riparian shade, lower stream flows caused by increased evapotranspiration, etc. The legacy log structures are acting to significantly increase width/depth ratios. In addition, large alder and willows are lacking along some of these meadow reaches. Past, late season grazing is thought to be a primary contributor to the lack of willow in these meadow environments. For the reaches with appropriate temperatures, water temperatures may be near their potential because stream channels and riparian vegetation are near their desired state and/or these reaches are located closer to water sources higher in the watershed.

With continued improvement in riparian and stream channel conditions, shading and a narrowing of stream channels could result in slightly lower stream temperatures. Even though it is assumed that stream temperatures were historically lower than they are today, it is questionable as to whether or not current state standards can be achieved in all stream reaches. Also, managing for beaver within these watersheds would likely have beneficial effects to fish habitat and improve stream temperature regimes. Beaver dams and their associated ponds would act to store water, which could augment late season flows and provide deep-water habitat and cool-water refugia.

As a result, the cumulative rating for the riparian vegetation, floodplains, and stream channels within the action plan area was found to be **Functioning-at-Risk***. This rating was based on professional judgement, which relied heavily upon the riparian and stream channel survey results. Even though several reaches contained one or more elements that were functioning inappropriately, all reaches contained several elements that showed at least moderate similarity to desired conditions. Even with the high level of anthropogenic impacts, the stream channels appear to be relatively stable but are unable to meet desired condition as long as legacy impacts remain, such as channel confining log structures, railroad grades, roads. In those cases where impacts—such as grazing—have been reduced, riparian vegetation and stream channels are moving towards desired conditions. Alder and willow regeneration is apparent along many of the reaches due primarily to a change in livestock grazing strategies. There are still localized areas, however, where the combination of livestock grazing and wild ungulate browsing is still suppressing hardwood regeneration and the development of late seral communities. It should also be noted that limited cottonwood regeneration is evident throughout the watershed.

RECOMMENDATIONS TO RESTORE RIPARIAN VEGETATION, FLOODPLAIN AND STREAM CHANNEL PROCESSES, AND WATER QUALITY — Malheur National Forest staff and ODFW fisheries biologists (Tim Unterwegner and Jeff Neal) reviewed watershed assessment information and field notes to prioritize stream reaches for watershed process and habitat enhancement projects in the action plan area. The results are as follows:

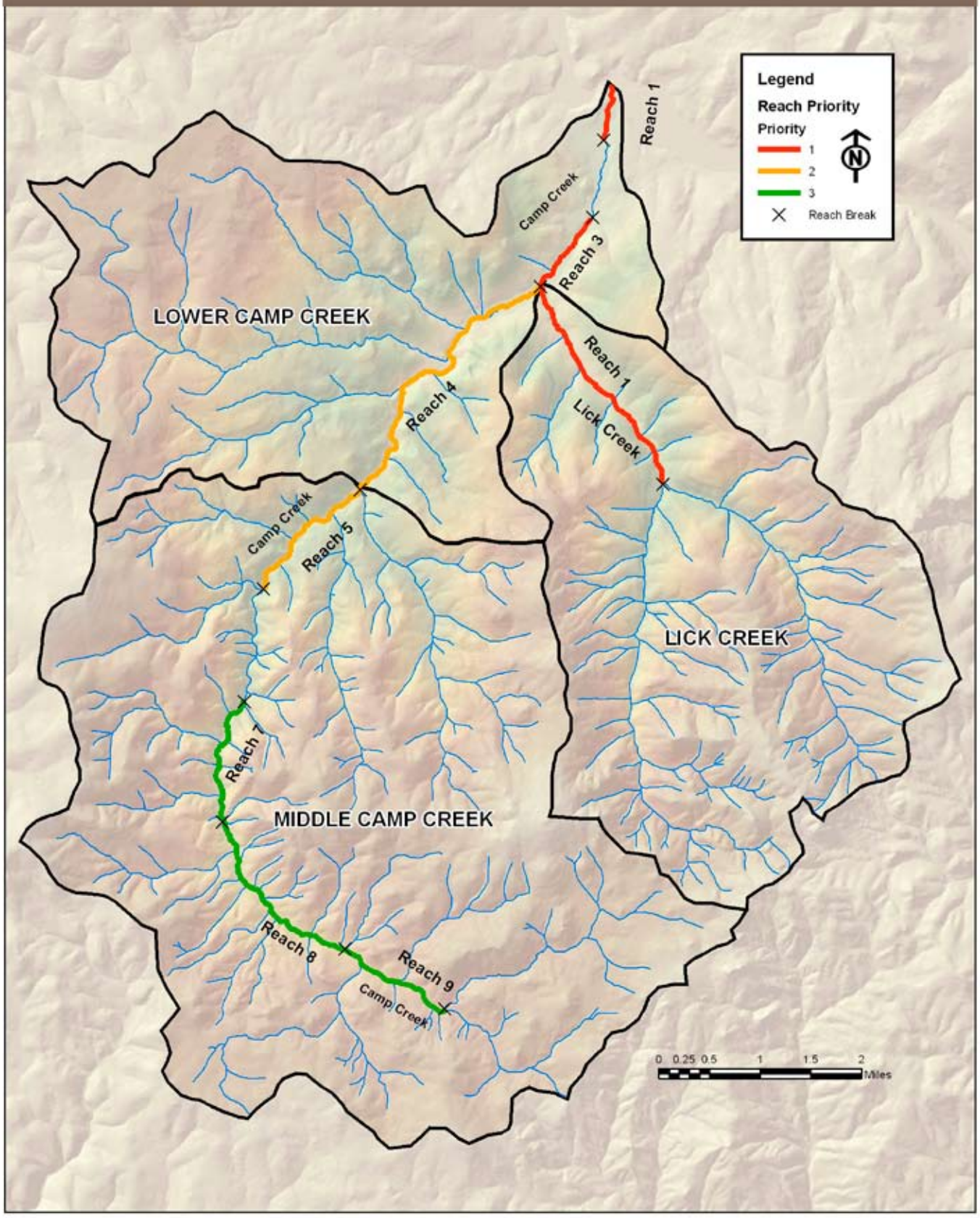
- **Remove legacy log-weirs and possibly railroad berms** to restore floodplain connectivity, channel forming processes, and improve water quality. Camp Creek reaches 1 and 3 were determined to be the highest priority, followed by Lick Creek reach 1, Camp Creek reaches 4 and 5, and finally Camp Creek reaches 7, 8, and 9. The criteria used to rank stream reaches for removal of legacy log-weirs included their connection to fish passage projects as well as linkage to stream channel type, quality and quantity of spawning and rearing habitat, and potential for headcutting associated with log weir removal.

- **In association with log-weir removal projects, install appropriate floodplain and in-channel structures** to decrease width/depth, create pools, capture spawning gravels, and increase sinuosity.

Refer to Figure 8 for location and prioritization of stream reaches for watershed process and habitat enhancement projects, all of which are designed to decrease width/depth ratios, create pools, capture spawning gravels, increase sinuosity, and improve water quality on nearly 15.8 miles of habitat within the action plan area (13 miles of Camp Creek and 2.8 miles of Lick Creek).

* Individual reach ratings are available upon request. Contact Tom Friedrichsen at tfriedrichsen@fs.fed.us

Figure 8. Instream Habitat Enhancement Priority



STEP 6 – PROJECT RANKINGS AND COST ESTIMATES TO COMPLETE WHOLE WATERSHED RESTORATION

OVERVIEW FROM THE RECOVERY PLAN AND SUBBASIN PLAN — Both plans provide similar guidance in ways to prioritize restoration projects and are consistent with restoration priorities offered by Roni et al. (2002) as presented earlier in this action plan. The Subbasin Plan (CBMRC&D 2005), for instance, rated the following activity categories as the highest priority for restoration in the Camp Creek Watershed: protect existing habitat, restore fish passage, riparian habitat improvements, and in-stream activities. The recovery plans did not identify site-specific projects within each category. Consequently, Step 6 of this action plan provides a prioritized list of site-specific restoration projects along with associated cost estimates. This project list is based on recommendations provided in Steps 2-5.

ASSESSMENT OF PROJECT RECOMMENDATIONS — The aquatic restoration projects identified for the action plan are an output of Steps 2-5, which presented four restoration categories ranked in order of importance: protection of existing habitat (Step 2), restore fish passage (Step 3), restoration of uplands (Step 4), and floodplain and instream projects (Step 5). Using this approach, a MFWG subgroup identified priority restoration objectives in each category:

Protection Objective — Protect 186 miles of stream channels and associated riparian areas through Riparian Habitat Conservation Areas on National Forest lands—99% of the action plan area. Specific actions include the revision of grazing practices to improve riparian vegetation and channel conditions in localized areas of upper Camp Creek, Coxie Creek, East Camp Creek, and Cottonwood Creek. Refer to Step 2 – Measures and Recommendations to Protect Fish Habitat and Figure 4.

Fish Passage Objective — Replace or remove 20 culverts to restore access to 25.8 miles of habitat, primarily for juvenile steelhead and spring Chinook salmon rearing. Refer to Step 3 – Assessment and Recommendations for Fish Passage and Figure 5.

Upland Process (vegetation & roads) Objective — Decommission 129 miles of roads—54 miles of roads within 200' of streams and 75 miles of roads more than 200' from streams. These projects will help restore upland and riparian hydrology and reduce sediment inputs into the stream network. Refer to Step 4 – Assessment and Recommendations for Upland Processes (Vegetation and Roads) and Figures 6 and 7.

Riparian Vegetation, Floodplain and Stream Channel Processes, and Water Quality Objective — Remove and/or redistribute 230 legacy log-weirs in Camp and Lick Creeks. Removal of railroad berms in reaches 1, 2, & 4 of Camp Creek may occur in association with log-weir removal. Expected benefits include reduced width-to-depth ratios (¼ to ½ of current values), increased sinuosity and pool numbers, and decreased stream temperatures. Refer to Step 5 – Assessment and Recommendations for Riparian Vegetation, Floodplain and Stream Channel Processes, and Water Quality and Figure 8.

ACTION PLAN AREA PROJECT RANKINGS AND COST ESTIMATES — Personnel from the Malheur National Forest and ODFW met and prioritized the projects referenced above. The results are presented in Table 2. The first priority is to protect existing riparian areas, thus promoting natural restoration, preventing further degradation. The second priority is fish passage restoration in Lick, Cougar, and Camp creeks, followed by less important fish-bearing streams. Next, log-weirs, many of which serve as juvenile passage barriers, will be removed in conjunction with fish passage projects. Finally, road projects are grouped to complement areas of fish passage and channel restoration.

Table 2. Priority Restoration Actions for Action Plan Area

Project Priority	Specific Action	Location	Limiting Factor	Benefit	Years to achieve response	Longevity of Action	Estimated Cost
1.	**Protection of Existing Riparian Areas and Fish Habitat in the Action Plan Area**						
	Maintain Riparian Habitat Conservation Areas	Along 186 miles of streams. Refer to Figure 4.	Riparian functions, such as stream shade, sediment buffer, bank stability, large wood and detritus inputs to stream.	Ensure protection of riparian areas and stream channels from impacts of management activities. Applies to 186 stream miles.			
2.	**Lick Creek Fish Passage (restoring juvenile fish access to cool water refugia and stream channel geomorphology)**						
a.	Remove legacy log-weirs and berms; LWD Placement	Camp Creek, reaches 1 & 3. Refer to Figure 8.	Degraded floodplains, channel morphology, stream temp. Prohibits juvenile access into upper Camp and Lick Creeks.	Remove/Replace 28 log-weirs to decrease W/D, create pools, capture spawning gravels, increase sinuosity, improve stream temps. Restore juvenile passage to 1.6 miles of stream.	1-5	5-20	$19,600
b.	Group 1 Culvert Replacements or Removals (Rm)	1. Lick – 1 2. Lick – 2 Rm* 3. Lick – 3 Refer to Figure 5.	Prohibits juvenile passage throughout Lick Creek.	Access to 9.0 miles of juvenile rearing habitat & thermal refugia	1-5	20-50+	1. $100,000 2. $20,000 3. $80,000 **$200,000**
c.	Remove legacy log-weirs; LWD Placement	Lick Creek, Reach 1. Refer to Figure 8.	Degraded floodplains, channel morphology, stream temp. Prohibits juvenile access into Lick Creek.	Remove/Replace 30 log-weirs to decrease W/D, create pools, capture spawning gravels, increase sinuosity, improve stream temps. Restore juvenile passage to 2.8 miles of stream.	1-5	5-20	$21,000
						Total	**$240,600**
3.	**Cougar Creek Fish Passage (restoring juvenile fish access to cool water refugia and stream channel geomorphology)**						
a.	Group 2 Culvert Replacements	Cougar – 1 Cougar – 2 WF Lick – 1 Refer to Figure 5.	Prohibits juvenile and adult passage throughout Cougar and WF Lick Creeks.	Access to 4.1 miles of juvenile rearing habitat & thermal refugia	1-5	20-50+	$80,000 $80,000 $100,000 **$260,000**
b.	Remove legacy log-weirs and berms; LWD Placement	Camp Creek, reaches 4 & 5. Refer to Figure 8.	Degraded floodplains, channel morphology, stream temp. Prohibits juvenile access into upper reaches of Camp Creek.	Remove/Replace 93 log-weirs to decrease W/D, create pools, capture spawning gravels, increase sinuosity, improve stream temps. Restore juvenile passage to 5.3 miles of stream.	1-5	5-20	$65,100
						Total	**$325,100**

Table 2. Priority Restoration Actions for Action Plan Area

Project Priority	Specific Action	Location	Limiting Factor	Benefit	Years to achieve response	Longevity of Action	Estimated Cost
4.	**Camp Creek Fish Passage (restoring juvenile fish access to cool water refugia and stream channel geomorphology)**						
a.	Group 3 Culvert Replacements or Retrofit (Retro) or Removals (Rm)	1. Camp – 1Retro 2. Camp – 2 3. Camp – 3 4. Camp – 4 Rm Refer to Figure 5.	Prohibits juvenile and adult passage throughout Camp Creek	Access to 4.5 miles of juvenile rearing habitat & thermal refugia	1-5	20-50+	1. $60,000 2. $80,000 3. $80,000 4. $20,000 **$240,000**
b.	Remove legacy log-weirs; LWD Placement	Camp Creek, reaches 7, 8, &9 Refer to Figure 8.	Degraded floodplains, channel morphology, stream temp. Prohibits juvenile access into upper reaches of Camp Creek and tributaries.	Remove/Replace 79 log-weirs to decrease W/D, create pools, capture spawning gravels, increase sinuosity, improve stream temps. Restore juvenile passage to 6.1 miles of stream.	1-5	5-20	$55,300
						Total	**$295,300**
5.	**Upper Camp Creek Tributary Fish Passage (restoring juvenile fish access to cool water refugia and stream channel geomorphology)**						
	Group 4 Culvert Replacements or Removals (Rm)	1. Coxie – 1 Rm 2. Eagle – 1 3. Big Rock – 1 4. Little Trail –1 5. Charlie – 1 Refer to Figure 5.	Prohibits juvenile and adult passage throughout Camp Creek	Access to 2.0 miles of juvenile rearing habitat & thermal refugia	1-5	20-50+	1. $20,000 2. $60,000 3. $60,000 4. $60,000 5. $60,000 **$260,000**
						Total	**$260,000**
6.	**Cottonwood Creek Fish Passage (restoring juvenile fish access to cool water refugia and stream channel geomorphology)**						
	Group 5 Culvert Replacements	1. Cottonwood – 1 2. Cottonwood – 2 Refer to Figure 5.	Prohibits juvenile and adult passage throughout Camp Creek	Access to 5.5 miles of juvenile rearing habitat & thermal refugia	1-5	20-50+	$60,000 $60,000 **$120,000**
						Total	**$120,000**
7.	**Upper Camp Creek Tributary Fish Passage (restoring juvenile fish access to cool water refugia and stream channel geomorphology)**						
	Group 6 Culvert Replacements or Removals (Rm)	1. Trib 12 – 1 2. Trib 12 – 2 3. Trib 12 - 3 Rm Refer to Figure 5.	Prohibits juvenile and adult passage throughout Camp Creek	Access to 0.7 miles of juvenile rearing habitat & thermal refugia	1-5	20-50+	1. $80,000 2. $60,000 3. $20,000 **$160,000**
						Total	**$160,000**

Table 2. Priority Restoration Actions for Action Plan Area

Project Priority	Specific Action	Location	Limiting Factor	Benefit	Years to achieve response	Longevity of Action	Estimated Cost
8-14	**Upland Process Restoration Projects and Grazing Monitoring**						
8.	Group 1 Road Decommission*	8 miles of road within 200' of Lick Creek and tributaries	Altered hydrology and sediment routing	Restored hydrology and sediment routing	5-20	Decades to centuries	**$22,000**
9.	Group 2 Road Decommission	35 miles of road within 200' of Camp, Cougar, and tributaries	Altered hydrology and sediment routing	Restored hydrology and sediment routing	5-20	Decades to centuries	**$86,000**
10.	Group 3 Road Decommission	11 miles of road within 200' of lower Camp, Cottonwood, and tributaries	Altered hydrology and sediment routing	Restored hydrology and sediment routing	5-20	Decades to centuries	**$31,000**
11.	Implementation and Effectiveness Monitoring**	Watershed-wide	Degraded riparian communities, channel structure, and water quality	To ensure grazing management does not retard recovery and to monitor implementation and effectiveness of restoration projects for 10 year period.	1-5	Decades to centuries	**$75,000** (7,500/year)
12.	Group 4 Road Decommission	16 miles of road outside 200' of Lick Creek and tributaries	Altered hydrology and sediment routing	Restored hydrology and sediment routing	5-20	Decades to centuries	**$38,000**
13.	Group 5 Road Decommission	42 miles of road outside 200' of Camp, Cougar, and tributaries	Altered hydrology and sediment routing	Restored hydrology and sediment routing	5-20	Decades to centuries	**$96,000**
14.	Group 6 Road Decommission	17 miles of road outside 200' of lower Camp, Cottonwood, and tributaries	Altered hydrology and sediment routing	Restored hydrology and sediment routing	5-20	Decades to centuries	**$40,000**
						Uplands Total	**$388,000**
						Priority Restoration Actions — Grand Total	**$1,789,000**

* Coordinate conifer thinning projects with road decommissioning activities to provide access to thinning units.
** Monitoring is part of the Intensively Monitored Watershed Program, a cooperative effort between the Malheur NF, PIBO, ODFW, OWEB, and NOAA Fisheries.

STEP 7 – ADAPTIVE MANAGEMENT MONITORING

OVERVIEW FROM THE RECOVERY PLAN AND SUBBASIN PLAN — The recovery plans place a strong emphasis on monitoring environmental objectives in the context of adaptive management. In the Subbasin Plan, for example, when an environmental objective is to reduce stream-channel width/depth ratios, projects should be monitored to determine if objectives have been met. Project managers would assess monitoring results (implementation and effectiveness) to determine if future projects require design and implementation adjustments to better meet environmental objectives. This action plan provides a detailed strategy for both implementation and effectiveness monitoring to determine if action plan objectives as described in Step 6 are being met.

MONITORING STRATEGY — Implementation and effectiveness monitoring will be conducted for all projects to determine the overall success of restoration actions listed in Table 2. The overall goal of the effectiveness monitoring program is to determine the extent to which restoration actions remove limiting factors for steelhead and spring Chinook salmon and will be directed at the following:

Protect Existing Habitat — Monitor for the maintenance of Riparian Habitat Conservation Areas and complete implementation monitoring of Best Management Practices for all management activities within the watershed. Complete implementation and effectiveness monitoring for livestock management at designated monitoring areas.

Fish Passage — Complete implementation monitoring (photos and accomplishment reports) of fish passage projects. To document project effectiveness, ODFW fish distribution surveys will be conducted prior to and after fish passage projects to assess fish use above project sites.

Upland Projects — Complete implementation monitoring (photos and accomplishment reporting) of road decommissioning projects. Effectiveness monitoring sites, described below, will help determine project effectiveness at the subwatershed scale.

Riparian Vegetation, Floodplains, Stream Channels, and Water Quality — Complete implementation monitoring (photos and accomplishment reports) of floodplain and instream projects. Effectiveness monitoring will be conducted to determine if the removal of legacy log-weirs result in the projected stream channel dimensions and attributes. The PACFISH/INFISH Biological Opinion (PIBO) monitoring protocols (Kershner et al. 2004) will be used to locate monitoring sites and direct assessments. Ten randomly selected stream reaches in the action plan area will be established. Five reaches will be located at restoration sites while five will serve as controls in non-restoration areas. At each site, surveys will be conducted to assess the following parameters prior to implementation of projects listed in Table 2 and every five years thereafter.

- **Physical Habitat Variables:** streambank stability, undercut banks, substrate, pool tail fines, % pool habitat, residual pool depths, large woody debris, bankfull and wetted widths, thalweg depth, and width/depth ratios
- **Biological:** macroinvertebrates
- **Water Chemistry:** water temperatures, conductivity, and alkalinity
- **Riparian Vegetation:** vegetation composition along streambanks and cross-sections

CONCLUSION: CAMP CREEK WHOLE WATERSHED RESTORATION, A NECESSARY STEP IN THE RECOVERY OF MC STEELHEAD AND CHINOOK SALMON

The projects listed in Table 2 address the limiting factors identified in the Recovery Plan and Subbasin Plan. When these projects are implemented, the cumulative benefits will result in whole watershed restoration of the action plan area. In this case, restoration is defined as restoring (within existing biological and social constraints) the natural habitat forming processes under which native fish evolved (Lichatowich et. al. 1995; Reeves et. al. 1995; Roni et. al. 2002), thus providing the freshwater conditions in which native fish can increase in numbers. This philosophy to recovery is consistent with the "Working Hypothesis" listed in the Subbasin Plan. In short, the "Working Hypothesis" encompasses a widely accepted paradigm that "habitat conditions interact with the native fish species to produce population distributions and abundance…," and "…that if the habitat restoration objectives are met, the focal species populations will respond in such ways that the aquatic objectives will also be met," both in quantitative and qualitative terms (CBMRC&D 2005).

The restoration of the Camp Creek Watershed is only a piece, albeit important, to recovery of steelhead and spring Chinook salmon populations in the John Day Basin. The viability of a population, such as MC Steelhead or spring Chinook salmon, is dependent upon the continued existence of well distributed subpopulations over specific time periods (Marcot and Murphy 1996). For example, the Middle Fork John Day River subbasin supports one of seventeen independent populations (subpopulations) that make up the MC steelhead (Carmichael 2007). A subpopulation can be segmented into distinct units, such as production or spawning areas (Carmichael 2007). The Recovery Plan identifies Camp Creek as a spawning area for steelhead, and the Subbasin Plan highlights Camp Creek as rearing area for spring Chinook salmon (CBMRC&D 2005). Both plans identify Camp Creek Watershed as the highest priority area for habitat protection and restoration in the Middle Fork subbasin.

This action plan, therefore, serves as the most efficient starting point to help secure the Middle Fork John Day subpopulations of MC steelhead and spring Chinook salmon in that it provides a road map to complete restoration of freshwater habitat in the subbasin's highest rated watershed. It does so by placing a strong emphasis on three subwatersheds—Lower Camp Creek, Middle Camp Creek, and Lick Creek. The MFWG believes that the ongoing projects in the other five subwatersheds have or will eliminate the most obvious obstructions to fish production in those areas. As such, the aquatic restoration projects listed in Table 2 coupled with completed and ongoing actions in other subwatersheds will help lead to whole watershed restoration of the entire Camp Creek Watershed. From that point, the MFWG can shift its recovery efforts to the remaining watersheds in the Middle Fork John Day Subbasin.

REFERENCES AND SOURCES OF INFORMATION

Carmichael, R.W. 2007. Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment. November, 2007 Review Draft.

CBMRC&D. 2005. John Day Subbasin Revised Draft Plan. Prepared for Northwest Power and Conservation Council. Portland, Oregon. March 15, 2005.

Furniss, M.J., T.D. Roelofs, and C.S. Yee. 1991. Road construction and maintenance. *In:* W.R. Meehan (editor) Influences of forest and rangeland management on salmonid fishes and their habitats. Special Publication 19. American Fisheries Society, Bethesda, Maryland.

Lichatowhich, J., L. Mobrand, L. Lestelle, and T. Vogel. 1995. An approach to the diagnosis and treatment of depleted salmon populations in Pacific Northwest watersheds. Fisheries Vol. 20, No. 1. pp. 10-18.

Kershner, Jeffrey L.; Archer, Eric K.; Coles-Ritchie, Marc; Cowley, Ervin R.; Henderson, Richard C.; Kratz, Kim; Quimby, Charles M.; Turner, David L.; Ulmer, Linda C.; Vinson, Mark R. 2004. Guide to effective monitoring of aquatic and riparian resources. Gen. Tech. Rep. RMRS-GTR-121. Fort Collins, CO: U.S. Department of Agriculture, Rocky Mountain Research Station. 57 p.

McNamara, M.L., M. Montgomery, T. Spivey, and B. Campbell. 2000. Shade for Seven Riparian Vegetation Groups, Upper Klamath Basin, Oregon. Unpublished Report in support of Klamath Basin TMDL.

Marcot, B.G. and D.D. Murphy. 1996. On population viability and management, p 58-76. In: Biodiversity in managed landscapes – theory and practice. Edited by Robert C. Szaro and David W. Johnston. Oxford University Press. New York, New York.

Moser, M. and D. Close. 2003. Assessing Pacific Lamprey Status in the Columbia River Basin, Project No. 1994-02600, 10 electronic pages, (BPA Report DOE/BP-00005455-5).

National Marine Fisheries Service (NMFS) 1999. Endangered and Threatened Species; Threatened Status for Two ESUs of Steelhead in Washington and Oregon. March 25, 1999, Federal Register/ VOL 64, No. 57. 50 CFR Part 223.

NOAA Fisheries. 2005. Final Assessment of NOAA Fisheries' Critical Habitat Analytical Review Teams for 12 Evolutionarily Significant Units of West Coast Salmon and Steelhead August 2005: Appendix J. CHART Assessment for the Middle Columbia River Steelhead ESU.

Reeves, G.H., L.E. Benda, K.M. Burnett, P.A. Bisson, and J.R. Sedell. 1995. A disturbance based ecosystem approach to maintaining and restoring freshwater habitats of evolutionary significant units of anadromous salmonids in the Pacific Northwest. American Fisheries Society Symposium 17:334-349.

Roni, P., T.J. Beechie, R.E. Bilby, F.E. Leonetti, M.M. Pollock, and G.R. Pess. 2002. A review of stream restoration techniques and a hierarchical strategy for prioritizing restoration in pacific northwest streams. North American Journal of Fisheries Management 22:1-20.

U.S. Department of Agriculture (USDA), Forest Service; and U.S. Department of the Interior (USDI), Bureau of Land Management (BLM). 1995. Decision notice/decision record, FONSI, environmental assessment, and appendices for the implementation of interim strategies for managing anadromous fish-producing watersheds in eastern Oregon and Washington, Idaho, and portions of California (PACFISH).

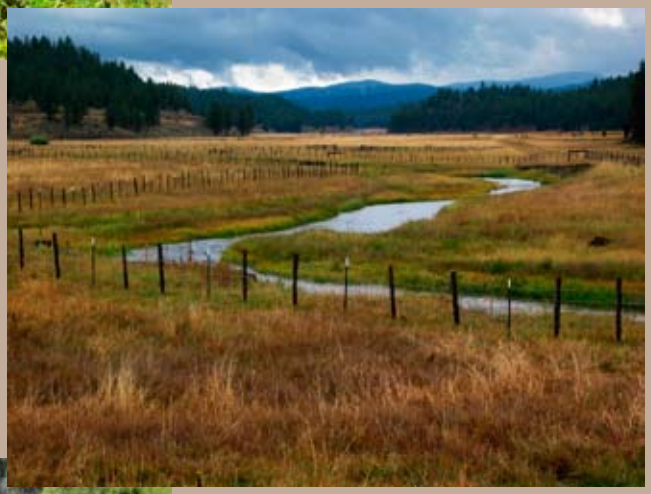
Watershed Professionals Network (WPN). 1999. Oregon Watershed Assessment Manual. June 1999. Prepared for the Governor's Watershed Enhancement Board, Salem, Oregon.

Wemple, B.C., J.A. Jones, and G.E. Grant. 1996. Channel network extension by logging roads in two basins, western cascades, Oregon. Water Resources Bulletin 32(6):1195-1207.

Wild Salmon Center. 2007. Wild Salmon Strongholds of North America, John Day Basin. Web link at: http://www.wildsalmoncenter.org/

MIDDLE FORK JOHN DAY RIVER
CAMP CREEK WATERSHED

Malheur National Forest



Riparian Restoration Project,
Confederated Tribes of Warm Springs

Channel Restoration, Dunstan Homestead Preserve,
The Nature Conservancy

MAL - 09 - 01